



Utilization of Soybean Oil as an Anti Mosquito Lotion

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Abstract- The use of repellents as anti-mosquito is currently feared to contain a lot of chemicals so it needs innovation to anticipate them. This study aims to make soybean oil as an innovation in making lotions and to know the manufacturing process. The method of extracting soybean oil is pressing using a Hydraulic Press. Soybean oil extraction based on 9 variables changes namely preheat temperature 100°C; 120°C; 140°C and pressure of Hydraulic Press 1800 psi; 2000 psi; 2200 psi as the test material, the best results were obtained at variable 5 with a variable 120°C and 2000 psi obtained the results of a density of 0,929 gr / ml, viscosity of 28,07 cP and a yield of 3,1%. Making lotion using variable 10 gr of the best soybean oil, Glycerin 20 gr, cetyl alcohol 4 gr, CMC 3 gr, Arabian Gom 0,5 gr and aquadest 10 ml, obtained the results of pH 6 and density 1,0428 gr/ml.

Keywords - hydraulic press, lotion, soybean oil

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1. Introduction

Soybean is a legume plant that is rich in vegetable protein, carbohydrates and fats. Soybean seeds also contain phosphorus, iron, calcium, vitamin B with complete amino acid composition, so that the potential for human body growth [8]. Soybeans also contain unsaturated acids that can prevent arterial sclerosis, which is hardening of the arteries [10]. Soybeans with high oil content can be used for a variety of industrial applications [4]. Various uses of soybean oil in the food industry include cooking oil, salad oil, ingredients for margarine, and shortening raw materials. More than 50 percent of food products are made from soybean oil, mainly margarine and shortening, and almost 90 percent of soybean oil production is used in a hydrogenated form [2]. Oil derived from soybeans is a source of alpha tocopherol, also known as vitamin E. Vitamin E is the main fat-soluble antioxidant in the body that functions to fight free radicals. Free radicals can trigger damage to cells that can cause premature aging. Besides vitamin E, soybean oil also contains vitamin A and most of the fatty acids that are beneficial to the body. Its fatty acid content includes unsaturated fatty acids (oleic, linoleic and linolenic acids) and saturated fatty acids (palmitic, stearic, and lauric acids) [3,9,11]. A fairly large content of fatty

acids contained in soy is linoleic acid ranging from 7-54% [1]. Linoleic and linolenic fatty acids are many unsaturated fatty acids and are classified as essential fatty acids. Soybean oil besides having linoleic fatty acids also has other unsaturated fatty acids such as oleic acid ranging from 11-60% and arachidonic acid 1.5%. The nutritional value of unsaturated fatty acids (essential fatty acids) in soybean oil or in soybeans can prevent the onset of clogged arteries (athero-sclerosis). By consuming soybeans and their processed products such as soy sauce, tempeh, tofu, and soy milk, we will avoid the dangers of clogged arteries [2].

Table 1. Soybean Oil Composition [5]

Component	Mass (%)
Unsaturated Fatty Acids (85%)	
Linoleic Acid	15 – 64
Oleic Acid	11 – 60
Linolenic Acid	1 – 12
Arachidonic Acid	1,5
Saturated Fatty Acids (15%)	
Palmitic Acid	7 – 10
Stearic Acid	2 – 5
Arachidic Acid	0,2 – 1
Lauric Acid	0 – 0,1

2. Methodology

This research was conducted in a laboratory scale with the method of extracting soybean oil that is pressing with a Hydraulic Press. Oil extraction based on 9 variable changes namely preheat temperature 100 °C; 120 °C; 140 °C and Hydraulic Press pressure 1800 psi; 2000 psi; 2200 psi as test material. The soybean research was conducted in order to get oil. After the oil is obtained then make lotion.

In this research, equipment used for the process of oil extraction and lotion making includes, among others, Pan, Oven, Press (Hydraulic Press), Digital Balance, Basin, Spoon, Filter Cloth, Tray, Erlenmeyer, Beaker Glass, Pycnometer, Ostwald Viscosimeter, Measuring cup, Dropper Pipette, Measuring Pumpkin, Watch Glass and Wipe Cloth. The ingredients used are Soybean, Aquadest, Glycerin, Cetyl Alcohol, CMC and Arabic Gum.

The research process is divided into three stages: the drying stage, the oil extraction stage and the lotion stage. In the process of drying material using an oven using a different temperature variable, which is equal to 100 °C, 120 °C and 140 °C. After that, the process of extracting oil by using a Hydraulic Press with pressure variables which is 1800 psi, 2000 psi, and 2200 psi. And after that the process of making lotions using the best oil results.

3. Results and Discussion

In this research, soybean drying was carried out first. The purpose of this drying is so that a lot of oil is produced. Drying was done in an oven with 3 temperature variables, 100 °C; 120 °C; and 140 °C. Before drying, soybeans are soaked in cold water and then dipped in hot water. After drying the soybeans, then continued with the process of extracting oil using the Hydraulic Press. In this process using 3 pressure variables, 1800 psi; 2000 psi; and 2200 psi. After the oil is obtained then the density, viscosity, yield and organoleptic tests are carried out. From the temperature and pressure variables that have been carried out, we get 10 volumes of oil; 11; 17; 18; 23; 26; 28; 30; 33 in milliliters. Therefore, the resulting yield value is 1,2; 1,61; 1,89; 1,98; 3,1; 3,39; 3,64; 3,82; 4,1 in percent.

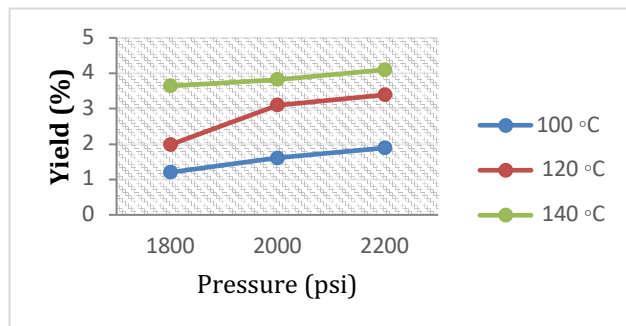


Figure 1. The effect of temperature and pressure on the yield(%)

From the graph above it can be seen that, the higher the temperature and pressure obtained the more yield obtained. This is consistent with the theory that

temperature and pressure are directly proportional to yield. And for consecutive density values of 0,891; 0,893; 0,905; 0,914; 0,929; 0,938; 0,951; 0,953; 0,976 in gr / ml units.

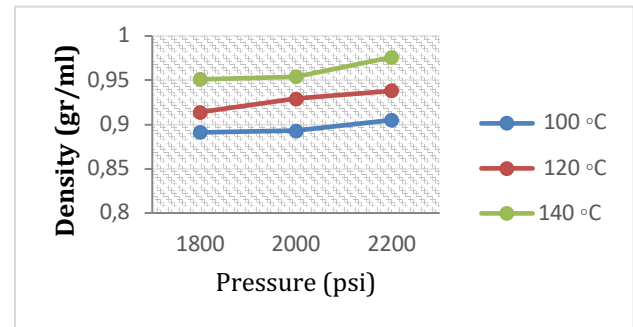


Figure 2. The effects of temperature and pressure on fluid density

From the graph above it can be seen that the higher the temperature and pressure, the higher the density produced. This is consistent with the theory that the temperature and pressure in a hydraulic press are directly proportional to the density produced. While the viscosity values obtained were 23,79; 24,48; 26,99; 27,44; 28,07; 29,57; 31,32; 31,77; 33,9 in cP units.

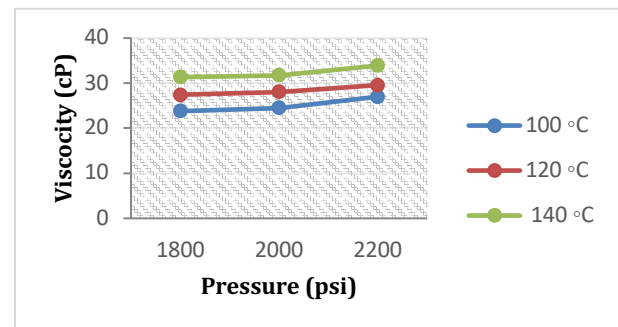


Figure 3. The effect of temperature and pressure on viscosity

From the graph above it can be seen that the higher the temperature and pressure, the higher the viscosity produced. This is consistent with the theory that the temperature and pressure in a hydraulic press are directly proportional to the resulting viscosity. While the FFA values obtained are 1,14; 1,17; 1,19; 1,2; 1,21; 1,22; 1,23; 1,24; 1,28 in percent.

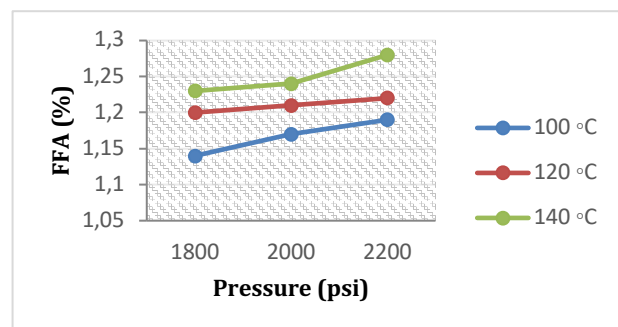


Figure 4. The effect of temperature and pressure on the FFA(%)

From the graph above, the graph shows increasing. The lowest FFA levels at 100 °C and 1800 psi pressure. The size of the % FFA affects the quality of the oil, where the higher % FFA content, the oil will be difficult to purify because there are still many impurities such as phosphotides, partial glycerides, waxes and saponified compounds which are still mixed in the extraction process and cause lower oil quality. It can be seen in the graph that our group does not fit the theory. If the FFA levels obtained, compared with the Indonesian National Standard (INS) the free fatty acid levels obtained not fulfilled of INS requirements, which is a maximum of 3%. This shows that the soybean oil produced is of good quality.

After extracting the oil, the lotion is made where the oil used in making the lotion is the best oil yield. The process of making lotions is to prepare side ingredients other than soy oil namely glycerin and cetyl alcohol into phase A, and prepare CMC, Arabic gum and aquadest ingredients as phase B. Phase A (soybean oil, glycerin and cetyl alcohol) and Phase B (CMC, arabic gum and aquadest) are heated to 60 ° C. After heating, insert Phase B into Phase A and add the remaining aquadest, then homogenized and cooled. From the making of this lotion, a pH of 6 is obtained, so that if the skin is used it is safe to use in accordance with the requirements of skin moisturizing quality according to INS in table 2.

Table 2. Quality Requirements for Skin Moisturizers [7]

No	Criteria	Unit	Requirements
1	Appearance	-	Homogeneous
2	Ph	-	4,5-8,0
3	Spesific gravity, 20°C	-	0,95-1,05
4	Viscosity, 25°C	cP	2000-50000
5	Microbial contamination	Colony/gram	Max 102

From the practicum we did in making mosquito repellent lotion from soybean oil by using a press, the results were obtained in the form of a lotion with organoleptic testing data with the hedonic test method according to Indonesian National Standard [6]:

$$n = \frac{N}{1+(Ne^2)}$$

Where,

n = Number of samples

N = Number of population

e = Error tolerance limit = 10% = 0.1

So that,

$$n = \frac{N}{1+(Ne^2)}$$

$$n = \frac{30}{1 + (30 \times 0,1^2)}$$

$$n = 23,077 \approx 23$$

Based on the above calculation, the number of panelists needed to conduct a hedonic test in this study was 23 panelists. Organoleptic test results in our research are listed in table 3.

Table 3. Organoleptic test results of Soybean Lotion Oil

Panelists	Observation results based on indicators			
	Textur e	Odo r	Colo r	Homogenei ty
I	7	5	6	7
II	6	5	5	6
III	6	5	6	7
IV	8	6	5	7
V	8	6	6	7
VI	6	6	5	6
VII	7	6	5	6
VIII	6	5	5	7
IX	7	7	6	6
X	7	6	5	6
XI	6	7	7	5
XII	7	8	8	6
XIII	7	5	5	7
XIV	6	6	6	7
XV	8	6	7	8
XVI	8	7	5	6
XVII	6	7	5	7
XVIII	7	6	6	6
XIX	8	8	7	8
XX	7	7	8	6
XXI	8	5	6	6
XXII	6	7	6	7
XXIII	7	6	7	7
Amount	159	142	137	151

Color : The color of the resulting lotion is turbid white because the color of the oil produced is yellow and the color of cetyl alcohol is turbid white

Texture : The texture obtained is slightly thick

Odor : Smells typical of soybean oil because it uses soybean oil

Homogeneity: Homogeneity between lotion - making ingredients with oil

$$P(\bar{x} - (1,96.s/\sqrt{n})) \leq \mu \leq (\bar{x} + (1,96.s/\sqrt{n})) \approx 95\%$$

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

$$S^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

where,

n = number of panelists

S² = diversity of quality values

- 1,96 = coefficient of standard deviation (95%)
 \bar{x} = average quality value
 x_i = quality value from panelist to i, where i is 1,2..n
 s = standard deviation of quality values

5. Conclusion

From the research that we have done on 9 samples of soybean oil, there is only 1 sample that meets the SNI of oil, namely the 5th sample with a density of 0,929 gr / ml, a viscosity of 28,07 cP, and a yield of 3,1%. Anti-mosquito lotion is in accordance with the theory, where the pH we get is 6, which is in accordance with the existing SNI that is equal to 4,5 – 8,0. For comparison the results of density and viscosity are directly proportional and the volume of oil obtained is also directly proportional to the yield. It can be concluded that our research accordance with existing theories.

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